

MIL-M-38510/55F  
30 April 1984  
SUPERSEDING  
MIL-M-38510/55E  
2 December 1981

MILITARY SPECIFICATION

MICROCIRCUITS, DIGITAL, CMOS, BUFFER/CONVERTER,  
TRUE/COMPLEMENT BUFFER, MONOLITHIC SILICON

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon, CMOS logic microcircuits. Two product assurance classes and a choice of case outlines and lead finishes are provided and are reflected in the complete part number.

1.2 Part number. The complete part number shall be in accordance with MIL-M-38510.

1.2.1 Device type. The device type shall be as follows:

<u>Device type</u>	<u>Circuit</u>
01 and 03	Inverting Hex Buffer
02 and 04	Noninverting Hex Buffer
05	Quad True/Complement Buffer
51 and 53	Inverting Hex Buffer
52 and 54	Noninverting Hex Buffer
55	Quad True/Complement Buffer

1.2.2 Device class. The device class shall be the product assurance level as defined in MIL-M-38510.

1.2.3 Case outline. The case outline shall be designated as follows:

<u>Outline letter</u>	<u>Case outline, (see MIL-M-38510, appendix C)</u>
A	F-1 (14-lead, 1/4" x 1/4", flat-package)
C	D-1 (14-lead, 1/4" x 3/4", dual-in-line package)
D	F-2 (14-lead, 1/4" x 3/8", flat-package)
E	D-2 (16-lead, 1/4" x 7/8", dual-in-line package)
F	F-5 (16-lead, 1/4" x 3/8", flat-package)
X	F-1 (14-lead, 1/4" x 1/4", flat-package) except dimension "A" = 0.1 (2.54 mm) maximum
Y	F-2 (14-lead, 1/4" x 3/8", flat-package) except dimension "A" = 0.1 (2.54 mm) maximum
Z	F-5 (16-lead, 1/4" x 3/8", flat-package) except dimension "A" = 0.1 (2.54 mm) maximum

NOTES

1. As an exception to 3.5.6.2.3 of MIL-M-38510, for case outlines X, Y and Z only, the leads of bottom brazed ceramic packages (i.e. configuration 2 of case outlines F-1, F-2, or F-5) may have electroless nickel undercoating which shall be 50 to 200 microinches (1.27 to 5.08  $\mu\text{m}$ ) thick provided the lead finish is hot solder dip (i.e. finish letter A) and provided that, after any lead forming, an additional hot solder dip coating is applied which shall extend from the outer tip of the lead to no more than 0.015 inch (0.38 mm) from the package edge.

2. For bottom or side brazed packages, case outlines X, Y and Z only, the S<sub>1</sub> dimension may go to .000 inch (.00 mm) minimum.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: George C. Marshall Space Flight Center, National Aeronautics and Space Administration, LATIN, EG02 Marshall Space Flight Center, Alabama, 35812 by using the self-addressed Standardization Document Improvement (DD Form 1426) appearing at the end of this document or by letter.

### **1.3 Absolute maximum ratings.**

Device types 01 and 02

Output load capacitance (each output) - - 200 pF when V<sub>CC</sub> > 10 V

### Device types 51 and 52

Supply voltage range ( $V_{DD} - V_{SS}$ ):  $V_{CC} \leq V_{DD} = -0.5$  to  $+10.0$  V

Output load capacitance (each output) - - 200 pF when  $V_{CC} > 10$  V

Device types 03, 04 and 05

Supply voltage range ( $V_{CC} - V_{SS}$ ) - - - - - 0.5 to +15.5 V

### Device types 53, 54 and 55

Supply voltage range ( $V_{CC} - V_{SS}$ ) - - - - - 0.5 to +18.0 V

### All device types

Input current (each input) = - - - - -  $\pm 10$  mA

Maximum power dissipation  $P_D = \dots = 200 \text{ mW}$

Lead temperature (soldering 10 seconds) = 300°C

Thermal resistance junction to case = - (See MIL-M-38510, appendix C)

Junction temperature -  $T_J = 175^\circ\text{C}$

#### 1.4 Recommended operating conditions.

Device types 01, 02, 03, 04, and 05

Supply voltage ( $V_{CC}$  or  $V_{DD} - V_{SS}$ ) = - - - 4.5 to 12.5 V dc

Input low ( $V_{IL}$ ) voltage range - - - - - 0-0.85 V dc @  $V_{CC}$  or  $V_{DD} = 5$  V;  
0-2.1 V dc @  $V_{CC}$  or  $V_{DD} = 12.5$  V

Input high ( $V_{IH}$ ) voltage range 1/ - - - 3.95-5.0 V dc @  $V_{CC}$  or  $V_{DD}$  = 5 V;  
10.0-12.5 V dc @  $V_{CC}$  or  $V_{DD}$  = 12.5 V

Device types 51, 52, 53, 54, and 55

Supply voltage ( $V_{CC}$  or  $V_{DD} - V_{SS}$ ) - - - 4.5 to 15.0 V dc

Input low ( $V_{IL}$ ) voltage range - - - - - 0-1.5 V dc @  $V_{CC}$  or  $V_{DD} = 5$  V;  
 0-2.0 V dc @  $V_{CC}$  or  $V_{DD} = 10$  V;  
 0-4.0 V dc @  $V_{CC}$  or  $V_{DD} = 15.0$  V;  
 $V_{OL} = 10\% V_{DD}$  or  $V_{CC}$ ;  $V_{OH} = 90\% V_{DD}$  or  $V_{CC}$

Input high ( $V_{IH}$ ) voltage range 1/ - - - - - 3.5-5.0 V dc @  $V_{CC}$  or  $V_{DD} = 5$  V;  
 8.0-10.0 V dc @  $V_{CC}$  or  $V_{DD} = 10$  V; 11.0-15.0 V dc @  $V_{CC}$  or  $V_{DD} = 15$  V;  $V_{OL} = 10\% V_{DD}$  or  $V_{CC}$ ;  
 $V_{OH} = 90\% V_{DD}$  or  $V_{CC}$

Case operating temperature range- - - - - -55°C to 125°C

Load capacitance- - - - - - - - - - - 50 pF maximum

## 2. APPLICABLE DOCUMENTS

2.1 Government specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation form a part of this specification to the extent specified herein.

### SPECIFICATION

#### MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

#### STANDARD

#### MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

## 3. REQUIREMENTS

3.1 Detail specification. The individual item requirements shall be in accordance with MIL-M-38510, and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein. Although eutectic die bonding is preferred, epoxy die bonding may be performed. However, the resin used shall be Dupont 5504 Conductive Silver Paste, or equivalent which is cured at 200°C +10°C for a minimum of 2 hours. The use of equivalent epoxies or cure cycles shall be approved by the qualifying activity. Equivalency shall be demonstrated in data submitted to the qualifying activity for verification.

3.2.1 Logic diagrams and terminal connections. The logic diagrams and terminal connections shall be as specified on figure 1.

3.2.2 Truth tables and logic equations. The truth tables and logic equations shall be as specified on figure 2.

3.2.3 Schematic circuits. The schematic circuits shall be submitted to the preparing activity prior to inclusion of a manufacturer's device in this specification and shall be submitted to the qualifying activity as a prerequisite for qualification. All qualified manufacturers' schematics shall be maintained and available upon request.

1/ The input high voltage ( $V_{IH}$ ) can exceed the power supply voltage ( $V_{CC}$ ) up to the maximum rating when device types 03, 04, 53, and 54 are used for logic level conversion.

3.2.4 Case outlines. The case outlines shall be as specified in 1.2.3.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 and 6.4 herein.

3.4 Electrical performance characteristics. The electrical performance characteristics are as specified in table I, and apply over the full recommended case operating temperature range unless otherwise specified.

3.5 Electrical test requirements. The electrical test requirements for each device class shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table III. V<sub>IL</sub> and V<sub>IH</sub> testing requires only a summary of attribute data.

3.6 Marking. Marking shall be in accordance with MIL-M-38510.

3.6.1 Total dose radiation hardness identifier. Total dose radiation hardness identifier shall be in accordance with MIL-M-38510 and 4.5.5 herein.

3.6.2 Serialization. All class S devices shall be serialized in accordance with MIL-M-38510.

3.6.3 Correctness of indexing and marking. All devices shall be subjected to the final electrical test in table II after part number marking, to verify that they are correctly indexed and identified by part number. Optionally, an approved electrical test may be devised especially for this requirement.

3.7 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 37 (see MIL-M-38510, appendix E).

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and methods 5005 and 5007 of MIL-STD-883, as applicable, except as modified herein.

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to qualification and quality conformance inspection. The following additional criteria shall apply:

- a. Delete the sequence specified in 3.1.9 through 3.1.13 of method 5004 and substitute lines 1 through 7 of table II herein.
- b. Burn-in tests (method 1015 of MIL-STD-883).
  1. Static tests (test condition A) use circuit shown on figure 3 or equivalent. Ambient temperature (T<sub>A</sub>) shall be 125°C minimum. Test duration for each static test shall be 24 hours minimum for class S devices and in accordance with table I, method 1015 for class B devices.
  2. Dynamic test (test condition D) use circuit shown on figure 4, or equivalent. Ambient temperature shall be 125°C minimum. Test duration shall be in accordance with table I, method 1015.
- c. Interim and final electrical parameters shall be as specified in table II herein.
- d. For class S devices, post dynamic burn-in, or class B devices, post static burn-in electrical parameter measurements may, at the manufacturer's option, be performed separately or included in the final electrical parameter measurements.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $V_{SS} = 0 \text{ V}$ , $-55^\circ\text{C} \leq T_C \leq 125^\circ\text{C}$ , unless otherwise specified	Device type 1/	Limits	Unit
				Min	Max
Positive clamping input to $V_{DD}$ or $V_{CC}$	$V_{IC(pos)}$	$T_C = 25^\circ\text{C}$ , $V_{DD}$ and $V_{CC} = \text{GND}$ , $V_{SS} = \text{Open}$ , Output = Open, $I_I = 1 \text{ mA}$	A11	+1.5	V dc
Negative clamping input to $V_{SS}$	$V_{IC(neg)}$	$T_C = 25^\circ\text{C}$ , $V_{DD}$ and $V_{CC} = \text{Open}$ , $V_{SS} = \text{GND}$ , Output = Open, $I_I = -1 \text{ mA}$	A11	-6	V dc
Quiescent supply current	$I_{SS}$	$V_{DD}$ and $V_{CC} = 15 \text{ V dc}$ , any combination of inputs	01-05	-750	nA dc
		$V_{DD}$ and $V_{CC} = 18 \text{ V dc}$ , any combination of inputs	51-55	-750	nA dc
High level output voltage	$V_{OH1}$	$V_{DD}$ and $V_{CC} = 4.5 \text{ V dc}$ , $I_{OH} = -0.1 \text{ mA}$ (see table III)	01-05	2.50	V dc
	$V_{OH2}$	$V_{DD}$ and $V_{CC} = 5 \text{ V dc}$ , $I_{OH} = -0.35 \text{ mA}$ (see table III)	01-05	4.5	V dc
	$V_{OH3}$	$V_{DD}$ and $V_{CC} = 5 \text{ V dc}$ , $I_{OH} = 0$ (see table III)	01-05	4.95	V dc
	$V_{OH4}$	$V_{DD}$ and $V_{CC} = 12.5 \text{ V dc}$ , $I_{OH} = 0$ (see table III)	01-05	11.25	V dc
	$V_{OH5}$	$V_{DD}$ and $V_{CC} = 15 \text{ V dc}$ , $I_{OH} = 0$ (see table III)	51-55	14.95	V dc
Low level output voltage	$V_{OL1}$	$V_{DD}$ and $V_{CC} = 5.5 \text{ V dc}$ , $I_{OL} = .23 \text{ mA}$ (see table III)	01-05	0.5	V dc
	$V_{OL2}$	$V_{DD}$ and $V_{CC} = 5 \text{ V dc}$ , $I_{OL} = 2.1 \text{ mA}$ (see table III)	01-05	0.5	V dc
	$V_{OL3}$	$V_{DD}$ and $V_{CC} = 5 \text{ V dc}$ , $I_{OL} = 0$ (see table III)	01-05	0.05	V dc
	$V_{OL4}$	$V_{DD}$ and $V_{CC} = 12.5 \text{ V dc}$ , $I_{OL} = 0$ (see table III)	01-05	1.25	V dc
	$V_{OL5}$	$V_{DD}$ and $V_{CC} = 15 \text{ V dc}$ , $I_{OL} = 0$ (see table III)	51-55	0.05	V dc

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $V_{SS} = 0 \text{ V}$ , $-55^\circ\text{C} \leq T_C \leq 125^\circ\text{C}$ , unless otherwise specified	Device type 1/	Limits		Unit
				Min	Max	
Input high voltage	$V_{IH1}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $ V_0  = (\text{see table III})$ , $ I_0  \leq 1 \mu\text{A}$	51, 53 52, 54, 55	4.0 3.5		V dc
	$V_{IH2}$	$V_{DD} \text{ and } V_{CC} = 10 \text{ V dc}$ , $ V_0  = (\text{see table III})$ , $ I_0  \leq 1 \mu\text{A}$	51, 53 52, 54, 55	8.0 7.0		V dc
	$V_{IH3}$	$V_{DD} \text{ and } V_{CC} = 15 \text{ V dc}$ , $ V_0  = (\text{see table III})$ , $ I_0  \leq 1 \mu\text{A}$	51, 53 52, 54, 55	12.0 11.0		V dc
Input low voltage	$V_{IL1}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $ V_0  = (\text{see table III})$ , $ I_0  \leq 1 \mu\text{A}$	51, 53 52, 54, 55		1.0 1.5	V dc
	$V_{IL2}$	$V_{DD} \text{ and } V_{CC} = 10 \text{ V dc}$ , $ V_0  = (\text{see table III})$ , $ I_0  \leq 1 \mu\text{A}$	51, 53 52, 54, 55		2.0 3.0	V dc
	$V_{IL3}$	$V_{DD} \text{ and } V_{CC} = 15 \text{ V dc}$ , $ V_0  = (\text{see table III})$ , $ I_0  \leq 1 \mu\text{A}$	51, 53 52, 54, 55		2.5 4.0	V dc
Output low (sink) current	$I_{OL1}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $ V_{IN}  = (\text{see table III})$ , $V_{OL} = 0.4 \text{ V dc}$	51-54 55	2.2 1.2		mA dc
	$I_{OL2}$	$V_{DD} \text{ and } V_{CC} = 15 \text{ V dc}$ , $ V_{IN}  = (\text{see table III})$ , $V_{OL} = 1.5 \text{ V dc}$	51-54 55	17.0 13.0		mA dc
Output high (source) current	$I_{OH1}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $ V_{IN}  = (\text{see table III})$ , $V_{OH} = 4.6 \text{ V dc}$	51-54 55	-0.36 -1.2		mA dc
	$I_{OH2}$	$V_{DD} \text{ and } V_{CC} = 15 \text{ V dc}$ , $ V_{IN}  = (\text{see table III})$ , $V_{OH} = 13.5 \text{ V dc}$	51-54 55	-2.4 -13.0		mA dc
Input leakage current	$I_{IH}$	$V_{DD} \text{ and } V_{CC} = 15 \text{ V dc}$	01-05		45	nA
		$V_{DD} \text{ and } V_{CC} = 18 \text{ V dc}$	51-55			
	$I_{IL}$	$V_{DD} \text{ and } V_{CC} = 15 \text{ V dc}$	01-05		-45	nA
		$V_{DD} \text{ and } V_{CC} = 18 \text{ V dc}$	51-55			
Input test voltage	$V_{ZAP}$	$C_1 = 100 \text{ pF}$ , $R_Z = 1.5 \text{ k}\Omega$ (see 4.5.3)	A11	400		V

See footnote at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $V_{SS} = 0 \text{ V}$ , $-55^\circ\text{C} \leq T_C \leq 125^\circ\text{C}$ , unless otherwise specified	Device type 1/	Limits		Unit
				Min	Max	
Input capacitance	$C_i$	$V_{DD} \text{ and } V_{CC} = 0 \text{ V dc}$ $f = 1 \text{ MHz}$ $T_C = 25^\circ\text{C}$	01, 51 03, 53 05, 55		20	pF
			02, 52 04, 54		12	
Propagation delay high to low level	$t_{PHL}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $C_L = 50 \text{ pF}$ (see figure 5)	51, 52, 01, 02	7	150	ns
			54, 04	11	225	ns
			55, 05	8	172	ns
			53, 03	2	225	ns
Propagation delay low to high level	$t_{PLH}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $C_L = 50 \text{ pF}$ (see figure 5)	51, 52, 01, 02	10	210	ns
			54, 04	17	345	ns
			55, 05	9	188	ns
			53, 03	8	345	ns
Transition times high to low level	$t_{TIL}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $C_L = 50 \text{ pF}$ (see figure 5)	51, 52, 01, 02	20	90	ns
			53, 54, 03, 04	5	105	ns
			55, 05	8	165	ns
Transition times low to high level	$t_{TLH}$	$V_{DD} \text{ and } V_{CC} = 5 \text{ V dc}$ , $C_L = 50 \text{ pF}$ (see figure 5)	51, 52, 01, 02, 53, 54, 03, 04	20	405	ns
			55, 05	9	180	ns

1/ Device types 01, 51, 52, and 02 have both  $V_{CC}$  and  $V_{DD}$  terminals. Device types 03, 53, 54, and 04 have only a  $V_{CC}$  terminal. Device type 05 and 55 have only a  $V_{DD}$  terminal.

TABLE II. Burn-in and electrical test requirements for device classification.

Line no.	Applicable tests and MIL-STD-883 test methods	Class S device 1/				Class B device 1/			
		Ref. par.	Table 2/ III subgroups	Table 3/ IV delta limits	Test circuit figure	Ref. par.	Table 2/ III subgroups	Table 3/ IV delta limits	Test circuit figure
1	Interim electrical parameters method 5004		1				1		
2	Static burn-in I method 1015	4.2b 4.5.2			3				
3	Same as line 1		1	Δ					
4	Static burn-in II method 1015	4.2b 4.5.2			3	4.2b 4.5.2	4/		3
5	Same as line 1		1*	Δ		4.2d	1*	Δ	
6	Dynamic burn-in method 1015	4.2b 4.5.2			4				
7	Same as line 1	4.2d	1*	Δ					
8	Final electrical parameters method 5004		1*,2,3,9				1*,2,3,9		
9	Group A end point electrical parameters method 5005	4.4.1	1,2,3,4,9, 10,11			4.4.1	1,2,3,4,9		
10	Group B end point electrical parameters method 5005	4.4.2	1,2,3,9, 10,11	Δ		N.A.			
11	Group C end point electrical parameters method 5005					4.4.3	1,2,3	Δ	
12	Additional group C tests, method 5005					4.4.3c	10,11		
13	Group D end point electrical parameters method 5005	4.4.4	1,2,3			4.4.4	1,2,3		

1/ Blank spaces indicate tests are not applicable.

2/ (\*) indicates PDA applies to subgroup 1 (see 4.2.1).

3/ (Δ) indicates delta limit shall be required on table III subgroup 1, where specified, and delta values shall be computed with reference to the previous interim electrical parameters.

4/ The device manufacturer may at his option either perform delta measurements or within 24 hours after burn-in (or removal of bias) perform the final electrical parameter measurements.

**4.2.1 Percent defective allowable (PDA).**

- a. The PDA for class S devices shall be 5 percent for static burn-in and 5 percent for dynamic burn-in, based on the exact number of devices submitted to each separate burn-in.
- b. Static burn-in I and II failures shall be cumulative for determining PDA.
- c. The class B devices PDA shall be in accordance with MIL-M-38510 for static burn-in. Dynamic burn-in is not required.
- d. Those devices whose measured characteristics after burn-in exceed the specified delta ( $\Delta$ ) limits or electrical parameter limits specified in table III, subgroup 1, are defective and shall be removed from the lot. The verified failures divided by the total number of devices in the lot initially submitted to burn-in shall be used to determine the percent defective for the lot; the lot shall be accepted or rejected based on the specified PDA.

**4.3 Qualification inspection.** Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.5).

**4.3.1 Qualification extension.** When authorized by the qualifying activity, if a manufacturer qualifies to a 51-55 device type which is manufactured identically to a 01-05 device type on this specification, then the 01-05 device type may be part I qualified by conducting only group A electrical tests and any electrics specified as additional group C subgroups and submitting data in accordance with MIL-M-38510, appendix D (i.e. groups A, B, C, D, and E tests are not required).

**4.4 Quality conformance inspection.** Quality conformance inspection shall be in accordance with MIL-M-38510 and as specified herein. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.5).

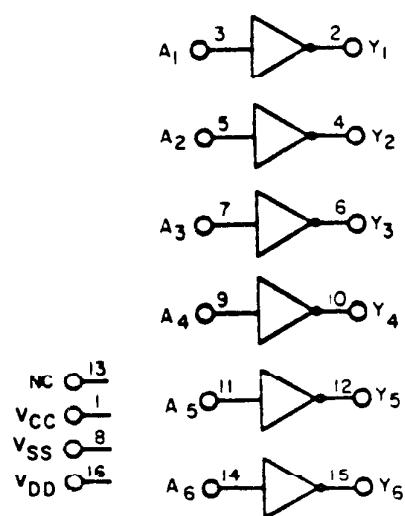
**4.4.1 Group A inspection.** Group A inspection shall be in accordance with table I of method 5005 of MIL-STD-883 and as follows:

- a. Test shall be performed in accordance with table II herein.
- b. Subgroups 5, 6, 7, and 8 of table I of method 5005 of MIL-STD-883 shall be omitted.
- c. Subgroup 4 ( $C_i$  measurement) shall be measured only for initial qualification and after process or design changes which may affect input capacitance. Capacitance shall be measured between the designated terminal and V<sub>SS</sub> at a frequency of 1 MHz.

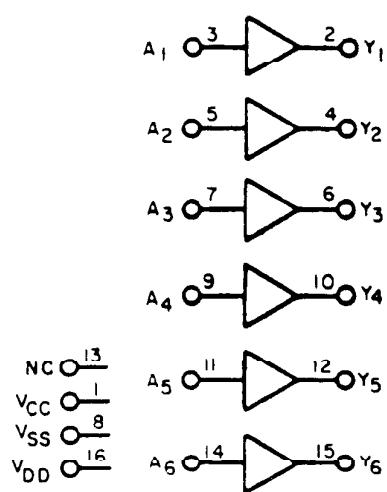
**4.4.2 Group B inspection.** Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883 and as follows:

- a. Class S steady state life (accelerated) test circuits shall be submitted to the qualifying activity for approval. When the alternate steady state life test is used, the circuit on figure 4, or equivalent, shall be used.
- b. A special subgroup shall be added using an LTPD of 15 for classes S and B, and shall be performed on each inspection lot for initially qualified device types 01, 02, and 05, and measured only for initial qualification and after process or design changes for initially qualified device types 03, 04, and 51-55. This subgroup shall consist of a high voltage test of the input protection circuits, V<sub>ZAP</sub> (see 4.5.3).
- c. End-point electrical parameters shall be as specified in table II herein and shall consist of those subgroups specified in table IIa of test method 5005 of MIL-STD-883, and table II herein also. Delta limits shall apply only to subgroup 5 of group B inspection, and shall consist of test specified in table IV herein.

Device types 01, 03, 51 and 53

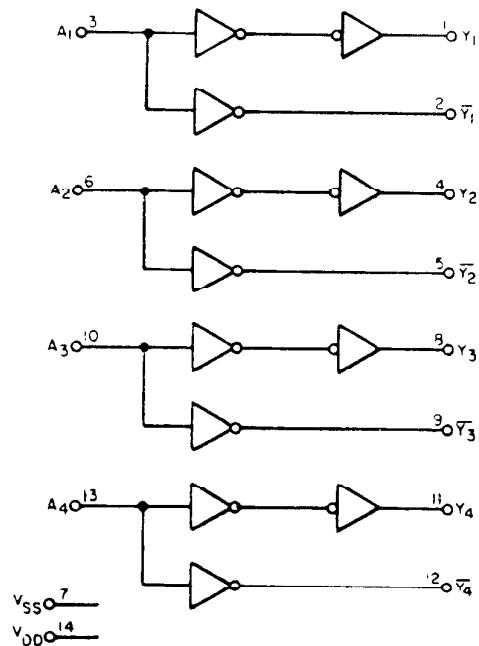


Device types 02, 04, 52 and 54



NOTE: Terminal 16 is not connected for device types 03, 04, 53 and 54.

Device types 05 and 55

FIGURE 1. Logic diagrams and terminal connections.

Device types 01, 03, 51 and 53

Truth table each gate	
Input	Output
A	Y
L	H
H	L

Positive logic:  $Y = \bar{A}$ 

Device types 02, 04, 52 and 54

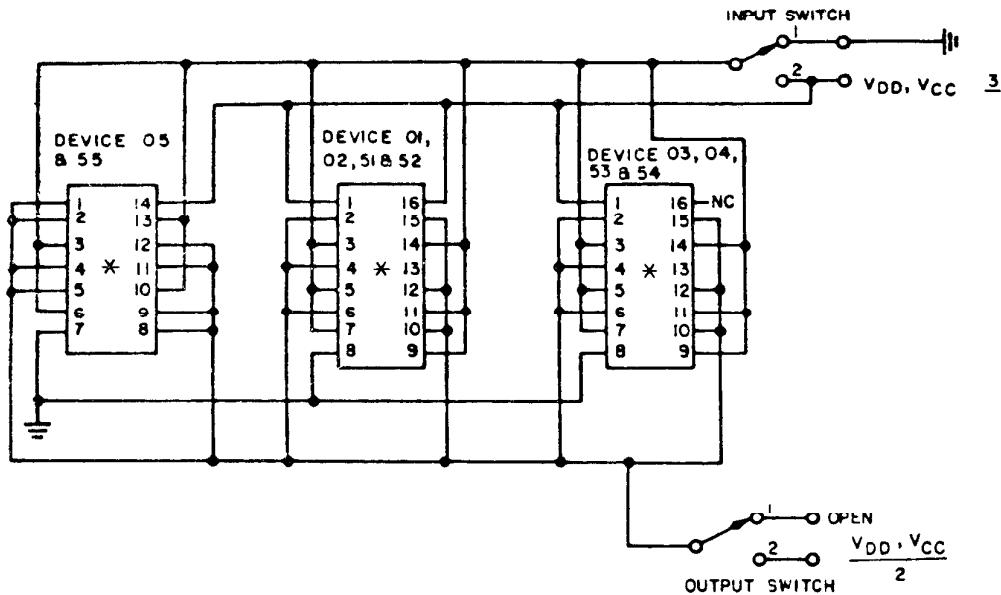
Truth table each gate	
Input	Output
A	Y
L	L
H	H

Positive logic:  $Y = A$ 

Device types 05 and 55

Truth table each gate		
Input	Output	$\bar{Y}$
A	Y	$\bar{Y}$
L	L	H
H	H	L

Positive logic:  $Y = A$ FIGURE 2. Truth tables and logic equations.

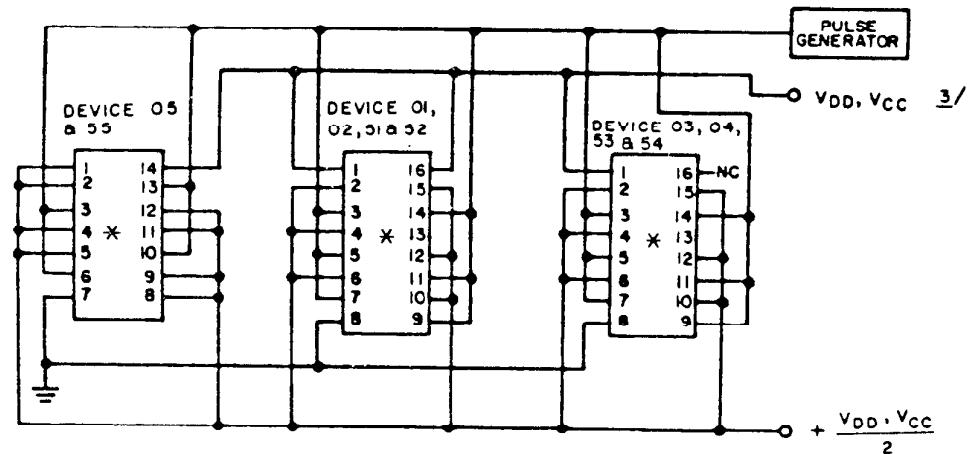


\* SEE NOTE 3.

NOTES:

1. For static burn-in I, all inputs are connected to 0 volts, switch position 1.
2. For static burn-in II, all inputs are connected to  $V_{DD}$ , switch position 2.
3. Except for  $V_{PP}$  and  $V_{SS}$ , each terminal shall be connected through a resistor whose value is 2 k $\Omega$  to 47 k $\Omega$ . The actual measured value of the resistor selected shall not exceed  $\pm 20\%$  of its branded value due to use, heat or age.
4. Output may be in switch position 1 or 2.
5.  $V_{DD} = 12.5$  V minimum, 15.0 V maximum for device types 01, 02, 03, 04 and 05.  
 $V_{DD} = 15.0$  V minimum, 18.0 V maximum for device types 51, 52, 53, 54 and 55.  
 $V_{DD}/2 = V_{DD}/2 \pm 1.0$  V for all devices.  
 $V_{SS} = 0.0$  V.

FIGURE 3. Static burn-in test circuits.

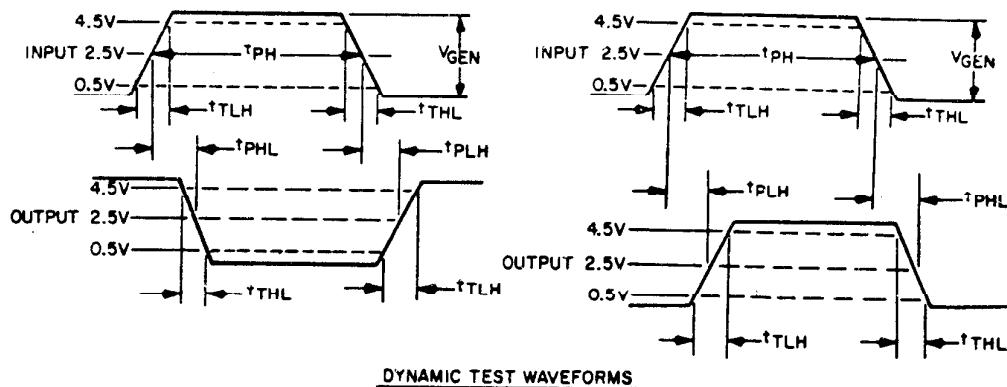
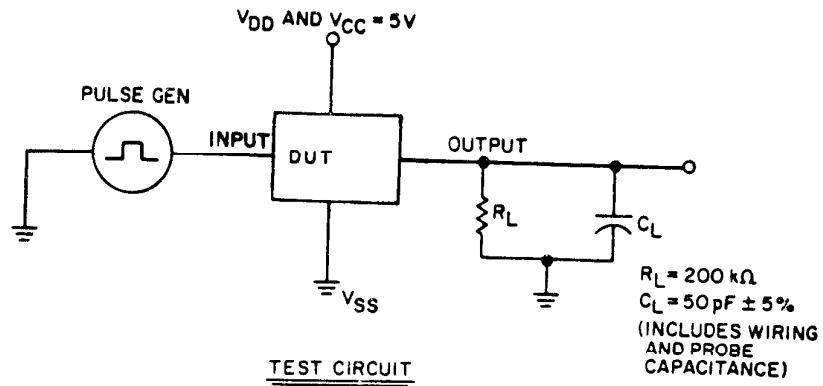


\* SFF NOTE 1.

NOTES:

1. Except for  $V_{pp}$  and  $V_{ss}$ , each terminal shall be connected through a resistor whose value is  $2\text{ k}\Omega$  to  $47\text{ k}\Omega$ . The actual measured value of the resistor selected shall not exceed  $\pm 20\%$  of its branded value due to use, heat or age.
2. Input signal requirements:
  - a. Square wave, 50% duty cycle.
  - b.  $25\text{ kHz} < \text{PRR} < 1\text{ MHz}$ .
  - c.  $t_{TLH}$  and  $t_{THL} < 1\text{ }\mu\text{s}$ .
  - d. Voltage level:  
Minimum =  $V_{ss} - 0.5\text{ V}$ ,  $+10\% V_{dd}$ .  
Maximum =  $V_{dd} + 0.5\text{ V}$ ,  $-10\% V_{dd}$ .
3.  $V_{dd} = 12.5\text{ V}$  minimum,  $15.0\text{ V}$  maximum for device types 01, 02, 03, 04 and 05.  
 $V_{dd} = 15\text{ V}$  minimum,  $18\text{ V}$  maximum for device types 51, 52, 53, 54 and 55.  
 $V_{dd}/2 = V_{dd}/2 \pm 1.0\text{ V}$ .  
 $V_{ss} = 0.0\text{ V}$ .

FIGURE 4. Dynamic burn-in and steady state life test circuit.

**NOTES:**

1. The pulse generator has the following characteristics:  $V_{gen} = V_{DD} \pm 1\%$ ,  $t_{PH} = 1.0 \pm 0.1 \mu s$ ,  $t_{TTL} = t_{TLH} = 10 \pm 2 \text{ ns}$  and PRR = 200 kHz.
2. See table III for complete terminal conditions.

FIGURE 5. Switching time test circuit and waveforms.

TABLE III. Group A inspection for device types 01 and 03.

Symbol	Cases MIL- STD-883 method	Test Conditions and limits, see <u>Y</u> and <u>Z</u>												Test Limits													
		V <sub>CC</sub> Test no.	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	V <sub>SS</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	NC	A <sub>6</sub>	Y <sub>6</sub>	V <sub>DD</sub>	GND	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	V <sub>dc</sub>		
V <sub>IC(pos)</sub>	See 4/ see 5/	1	GND		1 mA														1.5	-5							
V <sub>IC(neg)</sub>		2																									
I <sub>SS</sub>	3005	13	15.0 V		15.0 V		GND		15.0 V		15.0 V		GND		15.0 V		15.0 V		15.0 V		Y <sub>SS</sub>	-75					
I <sub>SS</sub>	see 5/	14	15.0 V		15.0 V		GND		15.0 V		15.0 V		GND		15.0 V		15.0 V		15.0 V		Y <sub>SS</sub>	-75					
V <sub>0H1</sub>	3006	15	4.5 V	I <sub>0H1</sub>	V <sub>1L1</sub>	I <sub>0H1</sub>	4.5 V	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	V <sub>dc</sub>													
V <sub>0H1</sub>		16																									
V <sub>0H1</sub>		17																									
V <sub>0H1</sub>		18																									
V <sub>0H1</sub>		19																									
V <sub>0H2</sub>	21	5.0 V	I <sub>0H2</sub>	V <sub>1L1</sub>	I <sub>0H2</sub>	5.0 V	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	V <sub>dc</sub>														
V <sub>0H2</sub>	22																										
V <sub>0H2</sub>	23																										
V <sub>0H2</sub>	24																										
V <sub>0H2</sub>	25																										
V <sub>0H2</sub>	26																										
V <sub>0H3</sub>	27																										
V <sub>0H3</sub>	28																										
V <sub>0H3</sub>	29																										
V <sub>0H3</sub>	30																										
V <sub>0H3</sub>	31																										
V <sub>0H3</sub>	32																										
V <sub>0H4</sub>	33	12.5 V																									
V <sub>0L1</sub>	33.7	3.9	5.5 V	I <sub>0L1</sub>	V <sub>1H1</sub>	I <sub>0L1</sub>	11.25 V	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	111.25													
V <sub>0L1</sub>		40																									
V <sub>0L1</sub>	41																										
V <sub>0L1</sub>	42																										
V <sub>0L1</sub>	43																										
V <sub>0L1</sub>	44																										

See footnotes at end of device type 05.

TABLE III. Group A inspection for device types 01 and 03 - Continued.

Symbol	MIL-STD-883 Test method	Test no.	Fuses [F,F <sub>2</sub> ]	For terminal conditions and limits see 1/ and 2/												Test limits			
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16 3/
V <sub>0,2</sub>	3007	45	5.0 V	I <sub>OL2</sub>	V <sub>IHL</sub>	I <sub>OL2</sub>	V <sub>IHL</sub>	I <sub>OL2</sub>	GND	V <sub>IHL</sub>	I <sub>OL2</sub>	V <sub>IHL</sub>	I <sub>OL2</sub>	V <sub>IHL</sub>	I <sub>OL2</sub>	5.0 V	Y <sub>1</sub>	0.5	0.5 Vdc
		46															Y <sub>2</sub>		
		47															Y <sub>3</sub>		
		48															Y <sub>4</sub>		
		49															Y <sub>5</sub>		
		50															Y <sub>6</sub>		
V <sub>0,3</sub>		51																	
		52																	
		53																	
		54																	
		55																	
		56																	
V <sub>0,4</sub>		57																	
		58																	
		59																	
		60																	
		61																	
		62																	
I <sub>IHL 6/</sub>	3010	63	15.0 V	I <sub>15.0</sub>	I <sub>15.0</sub>	V <sub>15.0</sub>	I <sub>15.0</sub>	V <sub>15.0</sub>	I <sub>15.0</sub>	V <sub>15.0</sub>	I <sub>15.0</sub>	V <sub>15.0</sub>	I <sub>15.0</sub>	V <sub>15.0</sub>	I <sub>15.0</sub>	15.0 V	A <sub>11</sub>	6	nA
I <sub>IHL 2</sub>		64																	
		65																	
		66																	
		67																	
		68																	
		69																	
I <sub>IHL 1 6/</sub>	3009	70																	
I <sub>IHL 2</sub>		71																	
		72																	
		73																	
		74																	
		75																	
		76																	
C <sub>1</sub>		3012	77	GND	A <sub>7/</sub>	A <sub>7/</sub>	A <sub>7/</sub>	A <sub>7/</sub>	GND	A <sub>7/</sub>	20 pF								
			78																
			79																
			80																
			81																
			82																

See footnotes at end of device type 05.

TABLE III. Group A inspection for device types 01 and 03 - Continue.

Symbol	MIL-STD-883 method	Test no.	Cases (E, F, Z)	For terminal conditions and limits see 1/ and 2/												Test Units								
				Subgroup 11/Unit terminal TC = 25°C				Subgroup 10/Unit TC = 125°C				Subgroup 9/Unit TC = 25°C				Subgroup 10/Unit TC = -55°C				Measured Subgroup 11/Unit TC = 25°C		Measured Subgroup 10/Unit TC = 125°C		
				V <sub>CC</sub>	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	V <sub>SS</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	NC	A <sub>6</sub>	Y <sub>6</sub>	V <sub>DD</sub>	Min Max <sub>8/</sub>	Min Max <sub>8/</sub>	Min Max <sub>8/</sub>	Min Max <sub>8/</sub>	
t <sub>PHL</sub>	3003 Fig. 5	83	5.0 v	0.1T	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	5.0 v	100/150	150/225	100/225	ns	
t <sub>PPLH</sub>		89			OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	A1 to Y1 A2 to Y2 A3 to Y3 A4 to Y4 A5 to Y5 A6 to Y6	110/140	140/230	10/8 315	10/8 230
t <sub>THL</sub>	3004 Fig. 5	95			OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	A1 to Y1 A2 to Y2 A3 to Y3 A4 to Y4 A5 to Y5 A6 to Y6	20/5	60/70	20/5 105	20/5 105
t <sub>TPLH</sub>		101			OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	Y1 Y2 Y3 Y4 Y5 Y6	90/20	10/8 105	20/5 105	60/70

See footnotes at end of device type 05.

TABLE III. Group A inspection for device types 02 and 04.

Symbol	MIL-STD-883 method	Cases E,F,Z	For terminal conditions and limits see 1/ and 2/												Measured terminal IC = 25°C	Subgroup 1 IC = 125°C	Subgroup 2 IC = -55°C	Unit											
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16 3/											
Test no.	V <sub>SC</sub>	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	V <sub>SS</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	N <sub>C</sub>	A <sub>6</sub>	Y <sub>6</sub>	V <sub>ID</sub>	GND	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>	A <sub>5</sub>	A <sub>6</sub>	Min	Max	Min	Max		
V <sub>IC(pos)</sub>	See 4/	1	AND																1.5										
V <sub>IC(neg)</sub>		2																	-6										
		3																											
		4																											
		5																											
		6																											
V <sub>SS</sub>	See 5/	7																											
V <sub>SS</sub>	see 5/	8																											
		9																											
		10																											
		11																											
		12																											
I <sub>SS</sub>	3005	13	15.0 V																										
I <sub>SS</sub>	see 5/	14	15.0 V																										
V <sub>OH1</sub>	3006	15	4.5 V	I <sub>OH1</sub>	I <sub>OH1</sub>	I <sub>OH1</sub>	I <sub>OH1</sub>	V <sub>IH1</sub>	I <sub>OH1</sub>	V <sub>IH1</sub>	I <sub>OH1</sub>	V <sub>IH1</sub>	I <sub>OH1</sub>	5.0 V	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	2.5	2.5	Vdc						
V <sub>OH1</sub>		16		I <sub>OH1</sub>	I <sub>OH1</sub>	I <sub>OH1</sub>	I <sub>OH1</sub>	V <sub>IH1</sub>	I <sub>OH1</sub>	V <sub>IH1</sub>	I <sub>OH1</sub>	V <sub>IH1</sub>	I <sub>OH1</sub>																
V <sub>OH1</sub>		17																											
V <sub>OH1</sub>		18																											
V <sub>OH1</sub>		19																											
V <sub>OH1</sub>		20																											
V <sub>OH2</sub>	21	5.0 V	I <sub>OH2</sub>	V <sub>IH1</sub>	I <sub>OH2</sub>	V <sub>IH1</sub>	I <sub>OH2</sub>	V <sub>IH1</sub>	I <sub>OH2</sub>	V <sub>IH1</sub>	I <sub>OH2</sub>	V <sub>IH1</sub>	I <sub>OH2</sub>	V <sub>IH1</sub>	I <sub>OH2</sub>	V <sub>IH1</sub>	I <sub>OH2</sub>	5.0 V	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	4.5	4.5	Vdc		
V <sub>OH2</sub>	22																												
V <sub>OH2</sub>	23																												
V <sub>OH2</sub>	24																												
V <sub>OH2</sub>	25																												
V <sub>OH2</sub>	26																												
V <sub>OH3</sub>	27																												
V <sub>OH3</sub>	28																												
V <sub>OH3</sub>	29																												
V <sub>OH3</sub>	30																												
V <sub>OH3</sub>	31																												
V <sub>OH3</sub>	32																												
V <sub>OH4</sub>	33	12.5 V																											
V <sub>OH4</sub>	34																												
V <sub>OH4</sub>	35																												
V <sub>OL1</sub>	36																												
V <sub>OL1</sub>	37																												
V <sub>OL1</sub>	38																												
V <sub>OL1</sub>	39	5.5 V	I <sub>OL1</sub>	V <sub>IL1</sub>	I <sub>OL1</sub>	V <sub>IL1</sub>	I <sub>OL1</sub>	V <sub>IL1</sub>	I <sub>OL1</sub>	V <sub>IL1</sub>	I <sub>OL1</sub>	V <sub>IL1</sub>	I <sub>OL1</sub>	V <sub>IL1</sub>	I <sub>OL1</sub>	V <sub>IL1</sub>	I <sub>OL1</sub>	5.5 V	Y <sub>1</sub>	Y <sub>2</sub>	Y <sub>3</sub>	Y <sub>4</sub>	Y <sub>5</sub>	Y <sub>6</sub>	0.5	0.5			
V <sub>OL1</sub>	40																												
V <sub>OL1</sub>	41																												
V <sub>OL1</sub>	42																												
V <sub>OL1</sub>	43																												
V <sub>OL1</sub>	44																												

See footnotes at end of device type 05.

TABLE III. Group A inspection for device types 02 and 04 - Continued.

Symbol	Cases MIL- STC-883 method	For terminal conditions and limits see $V$ and $Z$												Test limits			
		Y1	A1	Y2	A2	Y3	A3	Y4	A4	Y5	A5	Y6	A6	Y7	A7	Y8	A8
$V_{OL2}$	3007	45	5.0 V	$I_{OL2}$	$V_{IL1}$	$I_{OL2}$	$V_{IL1}$	$I_{OL2}$	$V_{IL1}$								
		46															
		47															
		48															
		49															
		50															
$V_{OL3}$		51															
		52															
		53															
		54															
		55															
		56															
$V_{OL4}$		57	12.5 V														
		58															
		59															
		60															
		61															
		62															
$I_{IH1} 6/$	3010	63	15.0 V														
$I_{IH2}$		64															
		65															
		66															
		67															
		68															
		69															
$I_{IL1} 6/$	3009	70															
$I_{IL2}$		71															
		72															
		73															
		74															
		75															
		76															
$I_C$		3012	77	GND													
			78														
			79														
			80														
			81														
			82														

See footnotes at end of device type 05.

TABLE III. Group A inspection for device types 02 and 04 - Continued.

Symbol	Cases E,F,Z	For terminal conditions and limits see <u>Y</u> and <u>Z</u>												Last limits									
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Test no.	V <sub>CC</sub>	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	V <sub>SS</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	NC	A <sub>6</sub>	Y <sub>6</sub>	V <sub>DD</sub>	Min	Max	Min	Max	Min	Max	
t <sub>PHL</sub>	3003 Fig. 5	83	5.0	Y	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	5.0	10/17/11	103/	7/11	15/	7/11	100/	ns
		84															115/		125/	150/			
		85																125/					
		86																					
		87																					
		88																					
t <sub>PLH</sub>	89			OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN								
		90																					
		91																					
		92																					
		93																					
		94																					
t <sub>THL</sub>	3004 Fig. 5	95		OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN								
		96																					
		97																					
		98																					
		99																					
		100																					
t <sub>T LH</sub>	101			OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN								
		102																					
		103																					
		104																					
		105																					
		106																					

See footnotes at end of device type 05.

TABLE III. Group A inspection for device type 05.

Symbol	Cases ML- STD-883 method	no.	For terminal conditions and limits see $\Sigma Y$ and $\Sigma Z$								Test limits			
			1	2	3	4	5	6	7	8	9	10	11	12
$V_{TC(005)}$		1												
		2												
		3												
		4												
$V_{TC(nea)}$		5												
		6												
		7												
		8												
$I_{SS}$	3005	9												
$I_{SS}$	See 5/	10												
$V_{OH1}$	3006	11	$I_{OH1}$											
		12		$V_{IH1}$										
		13			$I_{OH1}$									
		14				$V_{IL1}$								
		15					$I_{OH1}$							
		16						$V_{IL1}$						
		17							$I_{OH1}$					
		18								$V_{IL1}$				
$V_{OH2}$		19	$I_{OH2}$											
		20		$V_{IH1}$										
		21			$I_{OH2}$									
		22				$V_{IL1}$								
		23					$I_{OH2}$							
		24						$V_{IL1}$						
		25							$I_{OH2}$					
		26								$V_{IL1}$				
$V_{OH3}$		27				$V_{IH1}$								
		28					$I_{OH1}$							
		29						$V_{IL1}$						
		30							$I_{OH1}$					
		31								$V_{IL1}$				
		32									$V_{IH1}$			
		33										$I_{OH2}$		
		34											$V_{IL2}$	
$V_{OH4}$		35											$V_{IH2}$	
		36												$V_{IL2}$
		37												
		38												
		39												
		40												
		41												
		42												

See footnotes at end of device type 05.

TABLE III. Group A inspection for device type 05 - Continued.

See footnotes at end of device type D5.

TABLE III. Group A inspection for device type 05 - Continued.

Symbol	MIL-STD-883 method	Cases A,C,D X,Y	For terminal conditions and limits see 1/ and 2/										Test limits								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	Measured terminal $ I_t  = 25^\circ C$	Subgroup 1 $ I_t  = 25^\circ C$	Subgroup 2 $ I_t  = 125^\circ C$	Subgroup 3 $ T_A  = -55^\circ C$	Unit
$t_{IL2}$	3009	81 82 83 84	Y1	$\bar{Y}_1$	A1	$Y_2$	$\bar{Y}$	A2	VSS	$Y_3$	$\bar{Y}_3$	A3	$Y_4$	$\bar{Y}_4$	A4	VDD					
$C_1$	3012	85 86 87 88						GND		GND		GND		GND		15.0 V	A1 A2 A3 A4	-1	-45	nA	
$t_{PHL}$	3003 Fig. 5	89 90 91 92 93 94 95 96																			
$t_{PLH}$	97 98 99 100 101 102 103 104																				
$t_{THL}$	3004 Fig. 5	105 106 107 108 109 110 111 112																			
$t_{TLH}$		113 114 115 116 117 118 119 120																			

See footnotes at end of device type 05.

2/ Input pins not designated may be tied to V<sub>CC</sub> or GND or may be left open provided they do not influence the outcome of the measurement. Output pins not designated may be tied to the loads or may be left open provided they do not influence the outcome of the measurement.

Symbol	V <sub>IH1</sub>	V <sub>IL1</sub>	V <sub>IH2</sub>	V <sub>IL2</sub>	I <sub>OH1</sub>	I <sub>OL1</sub>	I <sub>OH2</sub>	I <sub>OL2</sub>	I <sub>OL3</sub>	I <sub>OL4</sub>
Device type	01 03 05	02 04 05	01 03 05	02 04 05	01 03 05	02 A11	04 A11	A11	A11	05
Temperature $T_C = 25^\circ\text{C}$	3.95 V	3.8 V	0.9 V	1.1 V	10.25 V	9.5 V	2.15 V	2.8 V	-.1 mA	.23 mA
$T_C = 125^\circ\text{C}$	3.85 V	3.6 V	0.65 V	0.85 V	10.0 V	9.25 V	1.95 V	2.55 V	-.1 mA	.23 mA
$T_C = -55^\circ\text{C}$	4.05 V	3.95 V	0.95 V	1.35 V	10.5 V	9.75 V	2.24 V	3.05 V	-.1 mA	.23 mA

3/ Terminal 16 is not connected for device types 03 and 04.

4/ Test parameter V<sub>IIC</sub>(pos) does not apply to device types 03 and 04.

5/ When performing quiescent supply current measurements ( $I_{SS}$ ), the meter shall be placed so that all currents flow through the meter.

6/ The device manufacturer may, at his option, measure I<sub>IL</sub> and I<sub>IH</sub> at 25°C for each individual input or measure all inputs together.

7/ (A) Capacitance bridge between measured terminal and V<sub>SS</sub>; frequency = 1 MHz.

8/ Test limits t<sub>PHL</sub>, t<sub>PLH</sub>, t<sub>THL</sub>, and t<sub>TLH</sub> for device types 01/03 and 02/04 consists of two sets of values and are expressed XXX/XXX in the limits columns. The digits preceding the slash apply to the first device in a set.

TABLE III. Group A inspection for device types 51 and 53.

Symbol	Cases MIL- STD-883 method	For terminal conditions and limits see <u>I</u>												Test limits							
		V <sub>CC</sub>	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	V <sub>S</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	NC	A <sub>6</sub>	Y <sub>6</sub>	V <sub>DD</sub>	Measured terminal I <sub>C</sub> = 25°C	Subgroup 1 I <sub>C</sub> = 125°C	Subgroup 2 I <sub>C</sub> = -25°C	Subgroup 3 I <sub>C</sub> = -55°C
V <sub>IC</sub> (pos)	3/ 1 2 3 4 5 6	GND		1 mA													GND	A <sub>1</sub> A <sub>2</sub> A <sub>3</sub> A <sub>4</sub> A <sub>5</sub> A <sub>6</sub>	1.5		
V <sub>IC</sub> (neg)	7 8 9 10 11 12			-1 mA													GND	A <sub>1</sub> A <sub>2</sub> A <sub>3</sub> A <sub>4</sub> A <sub>5</sub> A <sub>6</sub>	-6		
I <sub>SS</sub>	3005/4 3005/1	13 14	18 V	18 V	GND		18 V	GND	18 V	GND	18 V	GND	18 V	GND		18 V	Y <sub>SS</sub>	-75	-750	nAdc	nAdc
V <sub>0H5</sub>	3006 3007	15 16 17 18 19 20	15 V	GND	GND		15 V	Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub>	14.95	14.95	14.95	V <sub>dc</sub>									
V <sub>0L5</sub>	3007	21 22 23 24 25 26	15 V	15 V		Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub>	10.05	10.05	10.05												
V <sub>1H1</sub>	27 28 29 30 31 32	5 V	4.0 V	GND	GND		5 V	Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub>	0.5	0.5	0.5										
V <sub>1H2</sub>	33 34 35 36 37 38	10 V	8.0 V	8.0 V	GND	GND		10 V	Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub>	1.0	1.0	1.0									
V <sub>1H3</sub>	39 40 41 42 43 44	15 V	12.5 V	GND	12.5 V	GND		15 V	Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub>	1.5	1.5	1.5									

See footnotes at end of device type 55.

TABLE III. Group A inspection for device type: 51 and 53 - Continued.

MIL-M-38510/55F

See footnotes at end of device type 55.

TABLE III. Group A inspection for device type 51 and 53 - Continued.

Symbol	MIL-STD-483 method	Cases E, F, Z	For terminal concitions and limits see 1/												test limits									
			Test no.	V <sub>CC</sub>	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	Y <sub>SS</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	NC	A <sub>6</sub>	Y <sub>6</sub>	V <sub>D</sub>	16 2/ Measured terminal	Subgroup 1 TC = 25°C	Subgroup 2 TC = 125°C	Subgroup 3 TC = -55°C	Unit
I <sub>1H2</sub>	3010	88	18 V		18 V	GND			GND	GND									18 V	A1 A2 A3 A4 A5 A6	1 1 1 1 1 1	45 mA		
		89	18 V		18 V	GND			GND	GND									18 V					
		90	18 V		18 V	GND			GND	GND									18 V					
		91	18 V		18 V	GND			GND	GND									18 V					
		92	18 V		18 V	GND			GND	GND									18 V					
		93	18 V		18 V	GND			GND	GND									18 V					
I <sub>1L1 5/</sub>	3039	94																						
		95																						
		96																						
		97																						
		98																						
		99																						
		100																						
C <sub>1</sub>	3012	101	GND		A 6/				A 6/										GND	A1 A2 A3 A4 A5 A6	20	20 F		
		102	GND		A 6/				A 6/															
		103																						
		104																						
		105																						
		106																						

See footnotes at end of device type 55.

TABLE III. Group A inspection for device types 51 and 53 - Continued.

Symbol	Cases MIL- STC-883	For terminal conditions and limits see <u>Y</u>												test limits		Measured	Subgroup 9	Subgroup 10	Subgroup 11	Unit				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16 2/							
Test	V <sub>CC</sub>	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	V <sub>S</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	NC	A <sub>6</sub>	Y <sub>6</sub>	V <sub>DD</sub>	Min	Max	Min	Max	%			
t <sub>PHL</sub>	3003 Fig. 5	107 108 109 110 111 112	5.0 v	OUT	IN	OUT	IN	GND	IN	OUT	IN	OUT	IN	OUT	IN	5.0 v	A <sub>1</sub> to Y <sub>1</sub> A <sub>2</sub> to Y <sub>2</sub> A <sub>3</sub> to Y <sub>3</sub> A <sub>4</sub> to Y <sub>4</sub> A <sub>5</sub> to Y <sub>5</sub> A <sub>6</sub> to Y <sub>6</sub>	5/2 5/2 5/2 5/2 5/2 5/2	16C/65 12C 12C 12C 12C 12C	7/2 125	1150/ 125	5/2	60/65	ns
t <sub>PLH</sub>		113 114 115 116 117 118	0UT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		A <sub>1</sub> to Y <sub>1</sub> A <sub>2</sub> to Y <sub>2</sub> A <sub>3</sub> to Y <sub>3</sub> A <sub>4</sub> to Y <sub>4</sub> A <sub>5</sub> to Y <sub>5</sub> A <sub>6</sub> to Y <sub>6</sub>	7/8 120 120 120 120 120	1140/ 120 120 120 120 120	10/8 120 120 120 120 120	1140/ 120 120 120 120 120	7/8	1140/ 120 120 120 120 120	
t <sub>THL</sub>	3004 Fig. 5	119 120 121 122 123 124	0UT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub>	3/3 3/3 3/3 3/3 3/3 3/3	17C/60 10/8 10/8 10/8 10/8 10/8	90/ 105 105 105 105 105	3/3	170/60	ns	
t <sub>TLH</sub>		125 126 127 128 129 130	0UT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT		Y <sub>1</sub> Y <sub>2</sub> Y <sub>3</sub> Y <sub>4</sub> Y <sub>5</sub> Y <sub>6</sub>	13 160 160 160 160 160	1350/ 160 160 160 160 160	20 20 20 20 20 20	405 405 405 405 405 405	13 13 13 13 13 13	1350/ 160 160 160 160 160	

See footnotes at end of device type 55.

TABLE III. Group A inspection for device types 52 and 54.

Symbol	MIL-STC-883 Cases E,F,Z	Test No.	V <sub>CC</sub>	For terminal conditions and limits see 1/												Test limits							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	27	Measured Subgroup 1 Terminal V <sub>C</sub> = 25°C	Subgroup 2 Terminal V <sub>C</sub> = 125°C	Subgroup 3 Terminal V <sub>C</sub> = 55°C
V <sub>IC(pos)</sub>	3/	1	GND	1 mA	Y1	A1	Y2	A2	Y3	A3	Y <sub>SS</sub>	A4	Y4	A5	Y5	NC	A6	Y6	V <sub>DD</sub>	GND	A1	A2	A3
V <sub>IC(neg)</sub>	7	1	GND	1 mA	4	5	6													A4	A5	A6	1.5
I <sub>SS</sub>	3005 4/	13	18 V	18 V	8	9	10	11	12		-1 mA		-1 mA		-1 mA		1 mA			Vdc			
I <sub>SS</sub>	3005 4/	14	18 V	18 V	15	16	17	18	19	20													
V <sub>OH5</sub>	3006	15	15 V	15 V	16	17	18	19	20														
V <sub>OL5</sub>	3007	21	15 V	15 V	22	23	24	25	26														
V <sub>TH1</sub>	27	5 V	3.5 V	3.5 V	28	29	30	31	32														
V <sub>TH2</sub>	33	10 V	7 V	7 V	34	35	36	37	38														
V <sub>TH3</sub>	39	15 V	11 V	11 V	40	41	42	43	44														

See footnotes at end of device type 55.

TABLE III. Group A inspection for device types 52 and 54 - Continued.

Symbol	MIL- STD-883 method	Cases E,F,Z	For terminal conditions and limits see 1/												test limits					
			Test No.	YCC	Y1	A1	Y2	A2	Y3	A3	YSS	A4	Y4	A5	Y5	NC	A6	Y6	VDD	
V <sub>IL1</sub>			45	5 V	1.5 V GND				GND	3 ND GND	1.5 V 3 ND	GND	GND	GND	GND	GND	5 V	Y1 Y2 Y3 Y4 Y5 Y6	0.5	0.5 Vdc
			46																	
			47																	
			48																	
			49																	
			50																	
V <sub>IL2</sub>			51	10 V	3 V GND												10 V	Y1 Y2 Y3 Y4 Y5 Y6	1.0	1.0 TC = -55°
			52																	
			53																	
			54																	
			55																	
			56																	
V <sub>IL3</sub>			57	15 V	4 V GND												15 V	Y1 Y2 Y3 Y4 Y5 Y6	1.5	1.5 TC = 25°C
			58																	
			59																	
			60																	
			61																	
			62																	
I <sub>OL1</sub>			63	5 V	0.4 V												5 V	Y1 Y2 Y3 Y4 Y5 Y6	0.36	0.64 mA
			64																	
			65																	
			66																	
			67																	
			68																	
I <sub>OL2</sub>			69	15 V	1.5 V												15 V	Y1 Y2 Y3 Y4 Y5 Y6	2.4	4.2 TC = 125°
			70																	
			71																	
			72																	
			73																	
			74																	
I <sub>OH1</sub>			75	5 V	4.6 V	5 V GND											5 V	Y1 Y2 Y3 Y4 Y5 Y6	-0.51	-0.64 mA
			76																	
			77																	
			78																	
			79																	
			80																	
I <sub>OH2</sub>			81	15 V	13.5 V	15 V GND	13.5 V										15 V	Y1 Y2 Y3 Y4 Y5 Y6	-1.34	-2.4 TC = 125°
			82																	
			83																	
			84																	
			85																	
			86																	
I <sub>11H1</sub> 5/			3010	87	18 V	18 V											18 V	Y1 Y2 Y3 Y4 Y5 Y6	6	mA

See footnotes at end of device func

TABLE III. Group A inspection for device types 52 and 54 - Continued.

Symbol	Cases E,F,Z	For terminal conditions and limits see <u>L</u>												test limits						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16 2/ terminal	Measured Subgroup 1 TC = 25°C	Subgroup 2 TC = 125°C	Subgroup 3 TC = -55°C
Test no.	V <sub>CC</sub>	Y <sub>1</sub>	A <sub>1</sub>	Y <sub>2</sub>	A <sub>2</sub>	Y <sub>3</sub>	A <sub>3</sub>	V <sub>SS</sub>	A <sub>4</sub>	Y <sub>4</sub>	A <sub>5</sub>	Y <sub>5</sub>	NC	A <sub>6</sub>	Y <sub>6</sub>	V <sub>DD</sub>	Mn	Max	Mn	Max
I <sub>1H2</sub>	30:0	88 89 90 91 92 93	18 V GND	18 V GND	GND GND	GND GND	GND GND	GND GND	GND GND	GND 18 V GND	GND 18 V GND	GND 18 V GND		GND 18 V	A1 A2 A3 A4 A5 A6	18 V	18 V	18 V	18 V	
I <sub>1I1 5/</sub>	30:09	94																A1 A2 A3 A4 A5 A6	-6	-6
I <sub>1I1L2</sub>																		A1 A2 A3 A4 A5 A6	-1	-4.5
C <sub>1</sub>	30:12	101 102 103	GND	A 6/ A 6/ A 6/ A 6/ A 6/ A 6/												GND A 6/ A 6/ A 6/ A 6/ A 6/	12	pF	pF	

See footnotes at end of device type 55.

TABLE III. Group A inspection for device types 52 and 54 - Continued.

Symbol	MIL-STD-883 Cases F, F, Z	I <sub>C</sub> (A) Test no.	For terminal conditions and limits see <u>V</u>												Measured terminal time	Test time	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
t <sub>PHL</sub>	3003 Fig. 5	107 108 109 110 111 112	5.0 v OUT	IN	OUT	IN	OUT	IN	OUT	IN	AS	Y5	NC	A6	Y6	t <sub>DD</sub>	
t <sub>PPLH</sub>		113 114 115 116 117 118	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	5.0 v
t <sub>TPLH</sub>		119 120 121 122 123 124	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	t <sub>DD</sub>
t <sub>TTLH</sub>	3004 Fig. 5	119 120 121 122 123 124	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	t <sub>DD</sub>
t <sub>TLLH</sub>		125 126 127 128 129 130	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	t <sub>DD</sub>

See footnotes at end of device type 55.

TABLE III. Group A inspection for device type 55.

Symbol	Cases ML- STD-883 method	Test no.	Test Limits												
			1	2	3	4	5	6	7	8	9	10	11	12	13
$ V_{IC}(pos) $		1													
		2													
		3													
		4													
$ V_{IC}(neg) $		5													
		6													
		7													
		8													
$ I_{SS} $	3005 4/ 3005 7/	9													
		10													
$ Y_{OH5} $	3006	11													
		12													
		13													
		14													
		15													
		16													
		17													
		18													
$ Y_{OL5} $	3007	19													
		20													
		21													
		22													
		23													
		24													
		25													
		26													
$ V_{IH1} $		27													
		28													
		29													
		30													
		31													
		32													
		33													
		34													
$ V_{IH2} $		35													
		36													
		37													
		38													
		39													
		40													
		41													
		42													

See Footnotes at end of device type 55.

TABLE III. Group A inspection for device type 55 - Continued.

Symbol	Cases MIL- STD-883 method	For terminal conditions and limits see 1/												Measured terminal $T_C = 25^\circ C$	Measured terminal $T_C = 55^\circ C$	Test limits $T_C = 25^\circ C$	Test limits $T_C = 55^\circ C$					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	Y1	Y2	Y3	Y4	Y1	Y2	
Test no.	Y1	V1	A1	V2	V2	A2	VSS	Y3	A3	Y4	A4	VDD	Y1	Y2	Y3	Y4	Y1	Y2	Y3	Y4	Y1	Y2
$V_{TH3}$	43	11 V	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
	44	GND	GND	GND	GND	GND	11 V	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
	45	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
	46	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
	47	11 V	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
	48	GND	GND	GND	GND	GND	11 V	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
	49	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
	50	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	13.5	13.5	13.5	13.5	13.5	13.5		
$V_{LL1}$	51	1.5 V	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
	52	GND	GND	GND	GND	GND	1.5 V	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
	53	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
	54	GND	GND	GND	GND	GND	1.5 V	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
	55	GND	GND	GND	GND	GND	1.5 V	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
	56	GND	GND	GND	GND	GND	1.5 V	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
	57	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
	58	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	5 V	Y1	0.5	0.5	0.5	0.5	0.5	0.5		
$V_{LL2}$	59	3 V	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
	60	GND	GND	GND	GND	GND	3 V	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
	61	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
	62	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
	63	GND	GND	GND	GND	GND	3 V	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
	64	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
	65	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
	66	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	10 V	Y1	1.0	1.0	1.0	1.0	1.0	1.0		
$V_{LL3}$	67	4 V	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	68	GND	GND	GND	GND	GND	4 V	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	69	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	70	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	71	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	72	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	73	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	74	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	15 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
$I_{OL1}$	75	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	76	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	77	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	78	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	79	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	80	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	81	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	82	0.4 V					0.4 V						0.4 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	83	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
$I_{OL2}$	84	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	85	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	86	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	87	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	88	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	89	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		
	90	1.5 V					1.5 V						1.5 V	Y1	1.5	1.5	1.5	1.5	1.5	1.5		

See footnotes at end of device type 55.

TABLE III. Group A inspection for device type 55 - Continued.

See Footnotes at end of device type 55.

TABLE III. Group A inspection for device type 55 - Continued.

1 Input pins not designated may be tied to VCC or GND or may be left open provided they do not influence the outcome of the measurement. Output pins not designated may be tied to the loads or may be left open provided they do not influence the outcome of the measurement.

2/ Terminal 16 is not connected for device types 53 and 54.

37. Last statement V... I don't know how many to do

**4/** When performing quiet escent supply current measurements (ISS), the meter shall be placed so that all currents flow through the meter.

The device manufacturer may, at his option, measure  $T_{11}$  and  $T_{14}$  at  $25^\circ\text{C}$  for each individual input or measure all inputs together.

6/ (A) Capacitance bridge between measured terminal and  $V_{SS}$ ; Frequency = 1 kHz.  
 7/ Test limits  $t_{PHL}$ ,  $t_{PLH}$ ,  $t_{THL}$ , and  $t_{LH}$  for device types 51/53 and 52/54 consists of two sets of values and are expressed XXX/XXXX in the limits columns. The digits preceding the slash apply to the first device in a set.

**4.4.3 Group C inspection.** Group C inspection shall be in accordance with table III of method 5005 of MIL-STD-883 and as follows:

- a. End-point electrical parameters shall be as specified in table II herein. Delta limits shall apply only to subgroup 1 of group C inspection, and shall consist of tests specified in table IV herein.
- b. Steady state life test (method 1005 of MIL-STD-883) conditions:
  - 1. Test condition D and as specified in 4.5.2 and as shown on figure 4 or equivalent.
  - 2.  $T_A = 125^\circ\text{C}$ . minimum.
  - 3. Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.
- c. Subgroups 3 and 4 shall be added to the group C inspection requirements for class B devices, and shall consist of the tests, conditions, and limits as specified for subgroups 10 and 11 of group A.

**4.4.4 Group D inspection.** Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

**4.4.5 Group E inspection.** Group E inspection is required only for device types intended to be marked as radiation hardened (see 3.6.1). When group E testing is performed it shall be in accordance with table V of method 5005 of MIL-STD-883 and 4.5.5 herein.

**4.5 Methods of inspection.** Methods of inspection shall be specified as follows:

**4.5.1 Voltage and current.** All voltages given are referenced to the microcircuit  $V_{SS}$  terminal, unless otherwise specified. Currents given are conventional current and positive when flowing into the referenced terminal.

TABLE IV. Delta limits at  $25^\circ\text{C}$ .

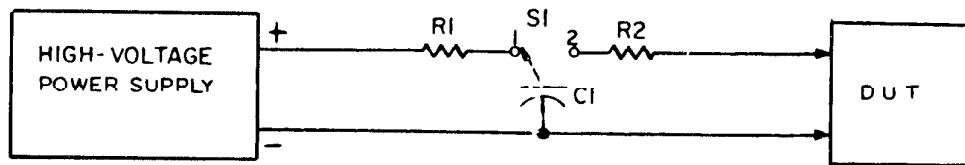
Parameter 1/	Device type	
	01-05	51-55
$I_{SS}$	$\pm 20 \text{ nA}$	$\pm 20 \text{ nA}$
$V_{OL1}$	$\pm .04 \text{ V}$	---
$V_{OH1}$	$\pm .08 \text{ V}$	---
$I_{OL1}$	---	$\pm 15\%$
$I_{OH1}$	---	$\pm 15\%$

1/ Each parameter shall be recorded before and after the required burn-in and life tests to determine delta's ( $\Delta$ ).

4.5.2 Burn-in and life test cool down procedures. When these tests are completed and prior to removal of bias voltages, the devices under test (DUT) shall be cooled to an ambient temperature of  $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ; then, electrical parameter end-point measurements shall be performed.

4.5.3 High voltage ( $V_{ZAP}$ ) test of input protection circuits. All input terminals (up to a maximum of 4) of the DUT shall be subjected to a voltage pulse from a 100 pF source charged to 400 V. This destructive test shall be conducted as follows using the test circuit on figure 6:

- a. Measure  $I_{IL}$  and  $I_{IH}$  at the inputs selected, as stated above, at  $25^{\circ}\text{C}$ . The test limit for each input tested shall be  $\pm 10 \text{ nA}$  at the specified  $V_{DD}$ . Measure  $I_{SS}$  on DUT at  $25^{\circ}\text{C}$ . The test limit for this measurement shall be increased a maximum of 20 percent of the specified  $I_{SS}$  table III limit at the specified  $V_{DD}$ .



$V_{ZAP} = 400 \text{ V}$  charge on  $C_1$ .  
 $1 \text{ M}\Omega \leq R_1 \leq 50 \text{ M}\Omega$   
 $R_2 = 1.5 \text{ k}\Omega$   
 $C_1 = 100 \text{ pF}$   
 $S_1 = \text{Hg-wetted "bounceless" relay}$

FIGURE 6. High voltage ( $V_{ZAP}$ ) test circuit.

- b.  $V_{ZAP}$  is applied to DUT in the following modes (see table V) by charging  $C_1$  to  $V_{ZAP}$  with  $S_1$  in position 1 and then switching to position 2.

TABLE V. Modes for high voltage test.

Mode	+ Terminal	- Terminal
1	$V_{DD}$	Input
2	Input	$V_{SS}$
3	Input	Associated output

- c. Within 24 hours repeat the  $I_{SS}$ ,  $I_{IH}$ , and  $I_{IL}$  measurements on the same terminals as performed above. If a DUT exhibits leakage currents in excess of the specified limits after the  $V_{ZAP}$  test, it shall be classified as a failure.

4.5.4 Quiescent supply current ( $I_{SS}$ ) test. When performing quiescent supply current measurements ( $I_{SS}$ ), the meter shall be placed so that all currents flow through the meter.

4.5.5 Radiation hardness assurance (RHA) testing. The RHA testing shall be performed in accordance with test procedures and sampling specified in table V of method 5005 of MIL-STD-883 and herein:

- a. Before irradiation, selected samples shall be assembled in qualified packages and pass the governing electrical parameters (group A subgroup 1 at 25°C) and also be subjected to the threshold-voltage test in table VIII in order to calculate the delta threshold ( $\Delta V_T$ ) after irradiation.
- b. The devices shall be subjected to a total radiation dose as specified in MIL-M-38510 for the radiation hardness assurance (RHA) level being tested, and meet the end point electrical parameters as defined in table VI at 25°C, after exposure. The start and completion of the end point electrical parameter measurements shall not exceed 2 hours following irradiation.
- c. Threshold-voltage test circuit conditions shall be as specified in table VIII and figure 7. In situ and remote testing, the test shall be performed with the devices biased in accordance with table VII and bias may be interrupted for up to 1 minute to remove devices to the remote bias fixture.
- d. After irradiation, the devices shall pass the truth table test as specified in subgroup 7 in table III or if subgroup 7 is not required, then an equivalent truth table test shall be performed.

TABLE VI. Radiation hardening end-point electrical parameters at 25°C.

Parameter	All device types	01-05	51-55
$V_{TN}$	0.3 V min	$V_{DD} = 10$ V	$V_{DD} = 10$ V
$V_{TP}$	2.8 V max	$V_{DD} = 10$ V	$V_{DD} = 10$ V
$\Delta V_T$	1.4 V max	$V_{DD} = 10$ V	$V_{DD} = 10$ V
$I_{SS}$	100 x max limit	$V_{DD} = 15$ V	$V_{DD} = 18$ V
$t_{PLH}$	1.35 x max limit	$V_{DD} = 5$ V	$V_{DD} = 5$ V
$t_{PHL}$	1.35 x max limit	$V_{DD} = 5$ V	$V_{DD} = 5$ V

TABLE VII. Bias during exposure to radiation.

Device type	Pin connections		
	10 V dc through a 30 kΩ to 60 kΩ resistor	$V_{SS} = GND$	$V_{CC}$ and $V_{DD} = 10$ V dc
01, 51	3, 5, 7, 9, 11, 14	8	1, 16
02, 52	3, 5, 7, 9, 11, 14	8	1, 16
03, 53	3, 5, 7, 9, 11, 14	8	1
04, 54	3, 5, 7, 9, 11, 14	8	1
05, 55	3, 6, 10, 13	7	14

Pins not designated are open or connected to 10 V dc through a 30 kΩ to 60 kΩ resistor.

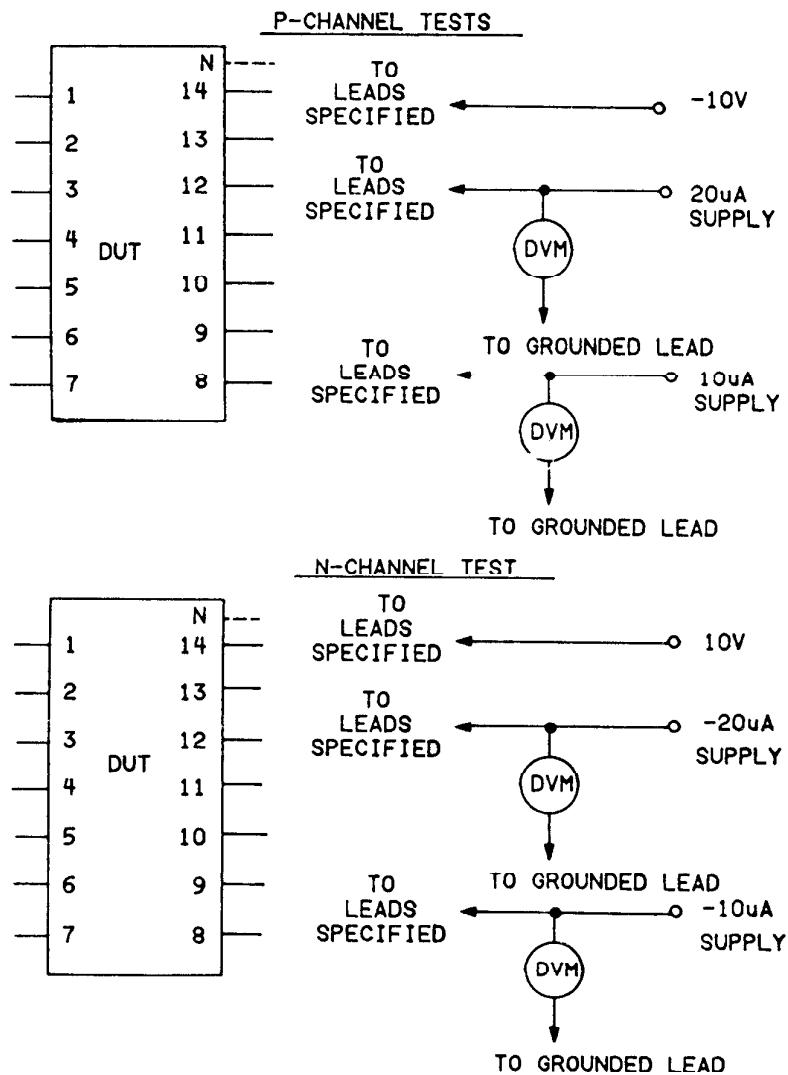
FIGURE 7. Threshold-voltage test circuit.

TABLE VIII. Threshold voltage test circuit conditions.

Device type	GND	10 V	$V_{TN}$ measured at		GND	-10 V	$V_{TP}$ measured at	
			-20 $\mu$ A supply	-10 $\mu$ A supply			20 $\mu$ A supply	10 $\mu$ A supply
01, 51	3	1, 16	5, 7, 8, 9, 11, 14		3	5, 7, 8, 9, 11, 14		1, 16
02, 52	3	1, 16	5, 7, 8, 9, 11, 14		3	5, 7, 8, 9, 11, 14		1, 16
03, 53	3	1	5, 7, 8, 9, 11, 14		3	5, 7, 8, 9, 11, 14		1
04, 54	3	1	5, 7, 8, 9, 11, 14		3	5, 7, 8, 9, 11, 14		1
05, 55	3	14	6, 7, 10, 13		3	6, 7, 10, 13		14

4.6 Data reporting. When specified in the purchase order or contract, a copy of the following data, as applicable, shall be supplied:

- a. Attributes data for all screening tests (see 4.2) and variables data for all static burn-in, dynamic burn-in, and steady state life tests (see 3.5).
- b. A copy of each radiograph.
- c. The quality conformance inspection data (see 4.4).
- d. Parameter distribution data on parameters evaluated during burn-in (see 3.5).
- e. Final electrical parameters data (see 4.2c).

## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

## 6. NOTES

6.1 Intended use. Microcircuits conforming to this specification are intended for original equipment design application and logistic support of existing equipment.

6.2 Ordering data. The acquisition document should specify the following:

- a. Complete part number (see 1.2).
- b. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.
- c. Requirement for certificate of compliance, if applicable.
- d. Requirements for notification of change of product or process to contracting activity in addition to notification to the qualifying activity, if applicable.
- e. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action, and reporting of results, if applicable.

- f. Requirements for product assurance options.
- g. Requirements for special carriers, lead lengths or lead forming, if applicable. These requirements shall not affect the part number. Unless otherwise specified, these requirements shall not apply to direct purchase by or direct shipment to the Government.
- h. Requirement for "JAN" marking.
- i. Requirement for total dose radiation testing (see 3.6.1 and 4.5.5), if applicable.

**6.3 Abbreviations, symbols, and definitions.** The abbreviations, symbols, and definitions used herein are defined in MIL-M-38510, MIL-STD-1331, and as follows:

VZAP - - - - - - - - - - - - - - - - -	Input test voltage.
C <sub>i</sub> - - - - - - - - - - - - - - - - -	Input terminal-to-V <sub>SS</sub> capacitance.
GND- - - - - - - - - - - - - - - - -	Ground. Zero voltage potential.
T <sub>A</sub> - - - - - - - - - - - - - - - - -	Free air temperature.
T <sub>THL</sub> - - - - - - - - - - - - - - - - -	Fall time. Time duration during which the amplitude of the trailing edge of the input forcing condition or waveform is decreasing from 90 to 10 percent of the maximum amplitude.
T <sub>TLH</sub> - - - - - - - - - - - - - - - - -	Rise time. Time duration during which the amplitude of the leading edge of the input forcing condition or waveform is increasing from 10 to 90 percent of the maximum amplitude.
V <sub>DD</sub> - - - - - - - - - - - - - - - - -	Positive supply voltage.
V <sub>SS</sub> - - - - - - - - - - - - - - - - -	Negative supply voltage.
I <sub>SS</sub> - - - - - - - - - - - - - - - - -	Quiescent supply current.
V <sub>IC(pos)</sub> - - - - - - - - - - - - - - -	Positive clamping input to V <sub>DD</sub> .
V <sub>IC(neg)</sub> - - - - - - - - - - - - - - -	Negative clamping input to V <sub>SS</sub> .

**6.4 Logistic support.** Lead materials and finishes (see 3.3) are interchangeable. Unless otherwise specified, microcircuits acquired for Government Logistic support shall be acquired to device class S for National Aeronautics and Space Administration or class B for Department of Defense (see 1.2.2), lead finish C (see 3.3). Longer length leads and lead forming shall not affect the part number.

**6.5 Substitutability.** The cross-reference information below is presented for the convenience of users. Microcircuits covered by this specification shall functionally replace the listed generic-industry type. Generic-industry microcircuit types may not have equivalent operational performance characteristics across military temperature ranges or reliability factors equivalent to MIL-M-38510 device types and may have slight physical variations in relation to case size. The presence of this information shall not be deemed as permitting substitution of generic-industry types for MIL-M-38510 types or as a waiver of any of the provisions of MIL-M-38510.

In all applications except multiplexers, four of the military device types are preferred for new designs and substitutable as follows. Device types 03 and 04 are replacements for device types 01 and 02 respectively. Device types 53 and 54 are replacements for device types 51 and 52 respectively.

Military device type	Generic-industry type
01	4009A
02	4010A
03	4049A
04	4050A
05	4041A
51	4009UB
52	4010B
53	4049UB
54	4050B
55	4041UB

**6.6 Handling.** MOS devices must be handled with certain precautions to avoid damage due to accumulation of static charge. Input protective devices have been designed in the chip to minimize the effect of this static buildup. However, the following handling practices are recommended:

- a. Devices should be handled on benches with conductive and grounded surface.
- b. Ground test equipment and tools.
- c. Do not handle devices by the leads.
- d. Store devices in conductive foam or carriers.
- e. Avoid use of plastic, rubber, or silk in MOS areas.
- f. Maintain relative humidity above 50 percent, if practical.

**6.7 Changes from previous issue.** Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

**Custodians:**

Army - ER  
Navy - EC  
Air Force - 17  
NASA - NA

**Preparing activity:**

NASA - NA  
(Project 5962-0638-5)

**Review activities:**

Army - MI  
Air Force - 11, 19, 85, 99  
DLA - ES

**User activities:**

Army - AR, SM  
Navy - AS, OS, CG, MC, SH

**Agent:**

DLA - ES